

PROF. WILLIAM F. DURAND, professor of marine engineering, has been appointed acting director of Sibley College, Cornell University, in succession to the late Prof. Thurston.

DR. MORRIS W. TRAVERS has been appointed professor of chemistry in University College, Bristol, in succession to Prof. Sydney Young, F.R.S. Dr. F. E. Francis, lecturer in chemistry, has been promoted to the rank of assistant professor in the college.

SPEAKING at Limerick last week in distributing prizes to the pupils of the Municipal Technical, Science and Art Schools, Sir Horace Plunkett remarked that the whole country had now taken up the work of technical education with a quickness, receptivity, and responsiveness which he was told by educational experts had not been witnessed in any country under similar economic conditions, and in so short a time. There was now scarcely a corner of Ireland where the people were not showing an anxiety and practical interest to take up a scheme which had been introduced under the auspices of the Department of Agriculture and Technical Instruction.

IN the course of an address at Liverpool on Saturday last Sir Philip Magnus remarked that our very existence as a nation depended upon our continued educational advance. There was a startling contrast between the liberal expenditure in America and Germany upon specialised university research and the small sums spent here. This country had little to learn from the method of teaching in American schools, but what we could and must learn if we were to recover lost ground was a changed attitude towards education itself. Few manufacturers in this country yet realised the economy and industrial advantages of attaching to their works intelligence departments staffed with scientific experts. He was glad to say, however, even in this respect the outlook was improving, and there were many signs of brighter days in store.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, November 19.—“The Sensation of Light produced by Radium Rays, and its Relation to the Visual Purple.” By W. B. Hardy and H. K. Anderson.

When a few milligrammes of radium bromide are brought near the head in the dark a sensation of diffuse light is produced. The authors find that this is not due to any direct response on the part of the retina, the optic nerve, or the brain, but to a fluorescence of the tissues of the eyeball, notably of the lens and of the retina itself, excited by the β and γ rays.

The visual purple of the retina is not bleached by any of the radium rays.

The authors point out in passing the peculiarly high opacity of the eyelid to the rays, as compared with the skin of other parts of the body.

Physical Society, November 13.—Dr. R. T. Glazebrook, F.R.S., president, in the chair.—Sir Oliver J. Lodge read a paper on means for electrifying the atmosphere on a large scale. Twenty years ago the author was engaged with Mr. J. W. Clark on an investigation of the dark spaces seen near hot bodies placed in illuminated smoke. The existence of these dust-free spaces was discovered by Tyndall, and the phenomenon had been investigated by Lord Rayleigh. Tyndall worked with high temperatures, and attributed the effect to the burning of the dust near the hot body. Such, however, cannot be the case, as the spaces exist when inorganic dust, such as oxide of magnesium, is used. The conclusion at which Messrs. Lodge and Clark arrived (see *Phil. Mag.*, 1884) was that the result was due to an aerial bombardment from the hot wire which drove the particles away, and they tried the effect of electrifying the hot body to see if there was any modification of the dark space. A new phenomenon was discovered, the whole of the dust being driven to the sides of the containing vessel. This experiment was shown by the author at the British Association meeting in Montreal in 1884, and subsequently, on a larger scale, at the Royal Institution. In the latter experiment two pieces of wire gauze, connected to the terminals

of an electric machine, were placed opposite each other in a smoke-filled chamber, through which a current of smoke was slowly passing. Upon electrifying the plates the smoke ceased passing, the dust particles cohered, hovered in the air, and were either driven to the sides of the chamber or fell to the bottom. In the case of mist, electrification of steam in a bell jar converted it into fine rain. It seems therefore possible that rain might be produced by the electrification of a cloud. Sir Oliver Lodge has tried at Liverpool to disperse fogs by discharging electricity into them. For this purpose a large mast was erected on the roof of the University College buildings. It terminated in a bundle of points, to which electricity was conveyed from a Wimshurst machine by a wire supported by specially constructed insulators. In order to drive electricity from a point far removed from a surface a high potential is necessary, and sometimes a large gas flame was used to supplement the points. Upon one occasion the discharge of electricity from the flame was sufficient to keep a clear space of 50 or 60 yards radius in a dense fog. The author had hoped to induce the Mersey Dock Board to try the principle on a large scale, having a series of positive discharges on one side of the river and a series of negative discharges on the other; but he felt a certain reluctance in recommending the method to practical men so long as it was necessary to derive the current from a Wimshurst machine. A dynamo would be a more suitable generator if it were possible to get a sufficiently high potential. The way out of the difficulty is to rectify a high-tension alternating current, and Sir Oliver Lodge has for some time been considering the possibility of doing this by utilising Cooper-Hewitt mercury lamps. A study of these lamps has led him to believe that their rectifying power is much assisted by the outside metallic coating which surrounds the mercury electrode, and which is connected to the positive terminal of the lamp. In order to rectify an alternating discharge, four lamps are so arranged in the form of a quadrilateral that, when the leads from the terminals of an alternating transformer are connected to two opposite corners, two unidirectional currents are obtained from the other corners. Experiments have been made at Birmingham by sending the current from a high-frequency alternator (3000 ~ per sec.) through the primary of an induction-coil and connecting the terminals of the secondary to the rectifiers. The length of the rectified spark can be increased by putting a number of lamps in series in each arm of the quadrilateral arrangement. Sir Oliver Lodge performed an experiment at the meeting to show the dissipation of fog by electrification. The current from an alternator was passed through the primary of a coil and the terminals of the secondary connected to the rectifiers, twelve lamps in all, three in series in each arm. This arrangement is capable of giving a rectified spark 2 or 3 inches long, the unidirectional nature of which can be proved by passing it through a Crookes or a Röntgen tube. Some magnesium wire having been burnt under a large bell jar to fill it with a cloud of magnesium oxide, the jar was then illuminated by the light from an electric lamp. Passing through the base-piece upon which the bell-jar was placed was a conductor which terminated in a point inside the jar. When the terminals between which the rectified discharge was passing were separated and the other end of this conductor was joined to one of them, the electricity streaming from the point into the clouded atmosphere caused an immediate deposition of the magnesium oxide.—Sir Oliver Lodge also described an arrangement for driving mercury pumps, designed by Mr. B. Davies and himself.

Chemical Society, November 5.—Prof. W. A. Tilden, F.R.S., president, in the chair.—The following papers were read:—The reduction of hydrazoic acid, by Mr. W. T. Cooke. The products were hydrazine and ammonia in place of the expected cyclic nitrogen hydride.—Preliminary note on the viscosity of liquid mixtures, by Messrs. A. E. Dunstan and W. H. C. Jemmett. The viscosity curve of a mixture of two non-associated liquids is a straight line, of a non-associated with an associated liquid, a line convex to the axes, and of two associated liquids, a line concave to the axes.—Contribution to the study of the reactions of hydrogen peroxide, by Mr. J. McLachlan. The evolution of oxygen induced by the addition of solutions of hydrogen peroxide to acidified solutions of potassium

bichromate or permanganate is not quantitative. Manganese dioxide reacts with hydrogen peroxide only in presence of sulphuric acid, and even then the reaction is incomplete.—The constitution of certain silicates, by Mr. C. **Simmonds**. The results obtained in a series of reduction experiments made on metallic silicates indicate that in complex silicates the silicon atoms are attached to each other, and each to two atoms of oxygen, the unappropriated oxygen atoms being those by which the metallic oxides are attached to the silica complex.—Constitution of chrysophanic acid and of emodin, by Messrs. H. A. D. **Jowett** and C. E. **Potter**. Chrysophanic acid is shown to be 5:8-dihydroxy-1-methylantraquinone, and emodin either 2:5:8- or 3:5:8-trihydroxy-1-methylantraquinone.—Conductivity of substances dissolved in certain liquefied gases, by Messrs. B. D. **Steele** and D. **McIntosh**. The conductivities of solutions of a number of substances in liquefied hydrogen chloride, bromide, iodide, sulphide, and phosphide have been determined.—The behaviour of metallic oxides towards fused boric anhydride, by Messrs. C. H. **Burgess** and A. **Holt**.—Note on some reactions of vanadium tetrachloride, by Mr. B. D. **Steele**. A description of the results obtained by the use of vanadium tetrachloride as a chlorinating and condensating agent in the synthesis of organic compounds.—Studies on comparative cryoscopy, i., the fatty acids and their derivatives in phenol solution, by Mr. P. W. **Robertson**. It is shown that the rate of association for fatty acids (normal) rises and falls as the series is ascended, and is influenced both by the nature and position of a substituent.—Vapour pressures of sulphuric acid solutions, by Mr. B. C. **Burt**.—Additive compounds of *sym*-trinitrobenzene and alkylated arylamines, by Messrs. H. **Hibbert** and J. J. **Sudborough**.—Interaction between chloric and hydriodic acids, by Mr. J. **McCrae**. A study of this reaction, and especially of the rate at which it progresses.—3:5-Dichloro-1:1:2-trimethyl- Δ^{24} -dihydrobenzene. A correction, by Mr. A. W. **Crossley**. This compound is now shown to be the corresponding derivative of unreduced benzene.—The estimation of hydroxylamine, by Messrs. H. O. **Jones** and F. W. **Carpenter**. The method is based on the reduction of alkaline copper solutions by hydroxylamine.—A study of the isomerism and optical activity of quinquivalent nitrogen compounds, by Mr. H. O. **Jones**. A number of derivatives of the type N.R.R''X have been prepared, but from these no optically active isomerides could be obtained.—The influence of various substituents on the optical activity of tartramide, by Messrs. P. F. **Frankland** and A. **Slator**.—The influence of cyclic radicals on optical activity; tartaric-*ar*- and *ac*-tetrahydro- β -naphthylamides, furfurylamide and piperidide, by Messrs. P. F. **Frankland** and E. **Ormerod**. Part of a systematic examination of the relationship between rotation and chemical constitution of optically active substances.—The rotatory power of maldiamide, maldi-*n*-propylamide, and maldibenzylamide, by Mr. J. **McCrae**.—Further experiments with phosphorus sesquisulphide, by Mr. E. G. **Clayton**. The results of the application of Mitscherlich's test to specimens of phosphorus sesquisulphide which had been exposed to air under various conditions were given.

Royal Astronomical Society, November 13.—Prof. H. H. **Turner**, F.R.S., president, in the chair.—Mr. P. H. **Cowell** read a paper on errors in the moon's tabular longitude as affecting the comparison of the Greenwich meridian observations from 1750 with theory.—The **Astronomer Royal** read a paper on the large sun-spots of October and November, and the associated magnetic disturbances, and exhibited photographs of the sun-spots taken at the Royal Observatory, and of the magnetic tracings, showing the most considerable disturbance to have been on October 31.—Mr. Newall showed and described a series of fine spectroheliographs of the great spot-groups, taken by Prof. G. E. **Hale**.—Mr. **Newbegin** showed photographs of the November sun-spots.—Spectroheliographs of the spot-groups taken on October 9 and 31 in K light by Mr. **Evershed**, showing the flocculent masses of faculae surrounding the spots, were also thrown on the screen.—Dr. **Lockyer** considered the correspondence of magnetic storms with solar prominences was more marked than with sun-spots, and pointed out that magnetic disturbances become more decided as the prominences approach the poles.—Father **Sidgreaves**

directed attention to the work at Stonyhurst, and to his conclusion that sun-spots are not the cause of magnetic disturbances, but that both phenomena have a common cause.—Father **Sidgreaves** then read a paper on a spectrographic study of β Lyræ at the Stonyhurst Observatory; he exhibited slides of a series of spectra taken at different dates, and explained his theory of the changes in the light of the star.—Prof. **Turner** gave an account of a method of photographing the moon with the surrounding stars, the results of which appeared very promising. In order to reduce its light the moon was covered by an opaque screen, in which was a slit; the screen was drawn slowly across the plate, and a sufficient exposure thus given, while images were obtained of stars down to about the ninth magnitude.—Many other papers were taken as read.

CAMBRIDGE.

Philosophical Society, November 9.—Mr. A. C. **Seward**, vice-president, in the chair.—Exhibition of living *Gongylus gongyloides*, a floral mantis, by Captain C. E. **Williams**. The insects exhibited show the pupal or nymph stage in the development of this mantis. They were hatched from the egg about January 18 of this year, and in the ordinary course should have attained the imago or winged state at the end of October. Development appears to have been arrested by the unsuitable climate of England, and by loss of appetite under confinement. The floral mimicry is effected by the foliaceous expansion of the prothorax around the insertion of the front pair of legs. This expansion is roughly diamond or oval shaped, and on the under side is of a bright azure blue tipped with rose purple at the angles and margins; in the centre of this disc is a deeply pigmented black spot of triangular shape. The front pair of legs are held closely folded together in the front of the coloured disc. The azure coloured disc resembles a small flower, and the black spot mimics the tube of a corolla. The attitude adopted by the insect when at rest and intent on catching its prey is an inverted position below a leaf or spray of leaves, the coloured side of the prothoracic disc being turned to the brightest light available. Insects, especially butterflies, are readily attracted by the floral simulation. The hinder part of the prothorax is drawn out into a long stalk and coloured a light green, enhancing the floral resemblance. The rest of the body is shaped and coloured to resemble a bunch of dead leaves, and is practically undiscernible amid its natural surroundings. The insects exhibited were brought from Rangoon.—Experiments in wheat breeding, by Mr. R. H. **Biffen** (see p. 92).

PARIS.

Academy of Sciences, November 16.—M. Albert **Gaudry** in the chair.—A new method of preparation of argon, by MM. H. **Moissan** and A. **Rigaut**. The argon is prepared in four stages, the first three of which, the removal of oxygen from the air by heated copper, concentration by passing over a mixture of lime and magnesium, twice, are identical with the processes worked out by Sir W. Ramsay and Lord Rayleigh. In the fourth stage the gas, after passing over a lime-magnesium mixture, is treated with pure metallic calcium at a dull red heat. Since calcium forms a hydride stable at 500° C., this removes at one operation the last traces of nitrogen and hydrogen. The apparatus produces one litre of pure argon in twelve hours.—Mr. G. W. **Hill** was elected a correspondant in the section of astronomy in the place of M. Schiaparelli, elected foreign associate.—On the analytical nature of the solutions of certain partial differential equations of the second order, by M. S. **Bernstein**.—On the use of the Schrader tacheograph in hydrographic work, by MM. F. **Schrader** and Ch. **Sauerwein**.—On the extraction of oxygen by the partial liquefaction of air, by M. Georges **Claude**. A method is described in which only a portion of the air is liquefied at a low pressure, and this liquid, with any preliminary evaporation, gives a gas containing 92 per cent. oxygen, the apparatus giving about 35 cubic metres of this per hour.—The measurement of very small angles of rotation, by M. Marcel **Brillouin**. Between the two Nicol prisms is introduced a thick plate of Iceland spar with parallel faces, cut at 45° to the axis, a half-wave plate, at 45° to the principal sections of the spar, and a second plate of spar similar to the first. It is possible to measure to

a half-second of arc with this arrangement.—On the determination of maxima and minima of transparency, by M. C. **Camichel**. A modification of the Gouy spectrophotometer, in which the two Nicols are replaced by a rotating disc, partly cut away in sectors.—Some remarks on the magnetic storm of October 31, by M. Em. **Marchand**. The author concludes that during magnetic storms the currents disturbing the earth's field are situated at least partially in the upper regions of the atmosphere. The magnetic storm coincided with the passage of an important group of sun-spots across the central meridian.—On a rigorous separation of the rare earths, by MM. G. **Urbain** and H. **Lacombe**. By the addition of the double nitrate of magnesium and bismuth to the mixture of double nitrates of rare earths, each earth has as its only impurity bismuth, which is readily removed, instead of another rare earth. The method has been applied with success to mixtures of samarium and gadolinium.—On kermes mineral, by M. J. **Bougault**.—On the acetylenic ketones, a new synthesis of the isoxazols, by MM. Ch. **Moureu** and M. **Brachin**. Ketones of the type of acetyl-phenyl-acetylene react quantitatively upon hydroxylamine, giving isoxazols.—On the retrogradation of starch, by M. L. **Maquenne**. The retrogradation is favoured by lowering the temperature and by the presence of minute amounts of mineral acids.—The influence of the nature of the external medium on the organic composition of the plant, by MM. Alex. **Hébert** and E. **Charabot**.—On the relation between the luminous intensity and energy of assimilation in plants belonging to different biological types, by M. Fr. **Weis**.—On the structure of the cotyledons and the disposition of certain adventitious roots in young labiate plants, by M. René **Viguer**.—On polymorphism in nitrates, by M. Frédéric **Wallerant**.—On some analogies of geological facies between the central zone of the eastern Alps and the internal zone of the western Alps, by M. Pierre **Fermier**.—On artesian wells, by M. D. **Pantanelli**. A consideration of the influence of the pressure exerted by the rock mass upon the subterranean sheet of water upon the well level.—On a new fossil-bearing level in the Keuper beds, by MM. M. **Piroutet** and Arm. **Laurent**.—A comparison of the letters of the alphabet from the point of view of the speed of writing. The formation of a rational alphabet, by MM. André **Broca** and D. **Sulzer**. The present alphabet is badly conceived from a physiological point of view. A series of signs is suggested by means of which the speed of recognition of letters could be increased one-third.—The electrical resistance of the human body, by M. Stéphane **Leduc**. The electrical resistance of the human body is especially the resistance of the skin, and this, like all electrolytes, depends on the nature and concentration of the ions it contains.—Contribution to the treatment of cancer by the X-rays, by M. **Biraud**. The disease was a typical epithelioma, and had recurred after one operation. After four months' treatment with the X-rays the pain disappeared, and the size of the tumour was reduced three-quarters.—Contribution to the study of hydrochloric acid in digestion, by MM. A. **Desgrez** and J. **Adler**.

DIARY OF SOCIETIES.

THURSDAY, NOVEMBER 26.

ROYAL SOCIETY, at 4.30.—Mathematical Contributions to the Theory of Evolution, XII., On a Generalised Theory of Alternative Inheritance, with Special Reference to Mendel's Laws: Prof. K. Pearson, F.R.S.—On the Distribution of Stress and Strain in the Cross-Section of a Beam: J. Morrow.—Some Experiments in Magnetism: T. C. Porter.

INSTITUTE OF ELECTRICAL ENGINEERS, at 8.—The Testing of Electric Generators by Air Calorimetry: R. Threlfall, F.R.S.—The Edison Accumulator for Automobiles: W. Hibbert.

FRIDAY, NOVEMBER 27.

PHYSICAL SOCIETY, at 5.—An Electrical Thermostat: Horace Darwin.—On the Occurrence of Cavitation in Lubrication: S. Skinner.—A Lecture Experiment in Electrical Resonance: Dr. W. Watson.

ROYAL ASTRONOMICAL SOCIETY, at 8.—Lecture by the President, Prof. H. H. Turner.

MONDAY, NOVEMBER 30.

SOCIETY OF ARTS, at 8.—The Mining of Non-Metallic Minerals: Bennett H. Brough. (Cantor Lectures. II.)

INSTITUTE OF ACTUARIES, at 5.—On the Comparative Mortality among Assured Lives of Abstainers and Non-Abstainers from Alcoholic Beverages: Mackenzie Moore.

TUESDAY, DECEMBER 1.

INSTITUTE OF CIVIL ENGINEERS, at 8.—Discussion of Paper on the Distribution of Mean and Extreme Annual Rainfall over the British Isles: Dr. H. R. Mill.

ZOOLOGICAL SOCIETY, at 8.30.—Note upon the Tongue and Windpipe of the American Vultures, with Remarks on the Inter-relations of the Genera *Sarcophagus*, *Gypagrus* and *Cathartes*: F. E. Beddard, F.R.S.—On the Mammals of Cyprus: Miss Dorothy M. A. Bate.—On the Cause of Death of a Polar Bear recently Living in the Society's Gardens.—Dr. R. N. Salaman.

WEDNESDAY, DECEMBER 2.

ENTOMOLOGICAL SOCIETY, at 8.

SOCIETY OF ARTS, at 8.—The Fiscal Problem: Sir C. M. Kennedy, K.C.M.G. GEOLOGICAL SOCIETY, at 8.—Note on the Garnet-bearing and Associated Rocks of the Borrowdale Volcanic Series: (The late) E. E. Walker.—A Contribution to the Glacial Geology of Tasmania: Prof. J. W. Gregory, F.R.S.

SOCIETY OF PUBLIC ANALYSTS, at 8.—The Characteristics of some Almond and Allied Oils: Dr. J. Lewkowitsch.—Note on the Quantitative Estimation of Mechanical Wood Pulp in Papers: C. F. Cross and E. J. Bevan.—The Estimation of Aldehydes and Ketones in Essential Oils: H. E. Burgess.—Note on the Estimation of Sperm Oil: L. M. Nash.

THURSDAY, DECEMBER 3.

ROYAL SOCIETY, at 4.30.—*Probable Papers*:—On the Fructification of *Neuropteris heterophylla*, Brongniart: R. Kidston, F.R.S.—Histological Studies on Cerebral Localisation: Dr. A. W. Campbell.

LINNEAN SOCIETY, at 8.—On Littoral Polychaeta from the Cape of Good Hope: Dr. Arthur Willey, F.R.S.—Notes on *Myriactis Areschougii* and *Colodasma californica*: Miss May Rathbone.

RÖNTGEN SOCIETY, at 8.30.—A New Jointless Section Wound Induction Coil, and a Flat Spiral High Frequency Apparatus: Leslie Miller.

AERONAUTICAL SOCIETY, at 8.—Report of the International Kite Competition—(1) Mathematical Portion: Prof. C. V. Boys, F.R.S.; (2) Descriptive Portion: Eric Stuart Bruce.—Preliminary Communication on the Longitudinal Stability of Aeroplane Machines: Prof. G. H. Bryan, F.R.S., and W. E. Williams.—The Balloon Ascents made by the late Mr. James Glaisher, F.R.S., for Scientific Purposes: W. Marriott.—The Mechanical Imitation of Bird Flight: W. Cochrane.

CHEMICAL SOCIETY, at 8.—On the Molecular Formulas of some Fused Salts as Determined by their Molecular Surface Energy: J. F. Bottomley.—Acid Salts of Monobasic Acids: R. C. Farmer.—The Atmospheric Corrosion of Zinc: G. T. Moody.—The Solubilities of the Hydrates of Nickel Sulphate: B. D. Steele and F. M. G. Johnson.

FRIDAY, DECEMBER 4.

GEOLOGISTS' ASSOCIATION, at 8.—On Land, Freshwater and Estuarine Deposits, with Special Reference to Recent Excursions; Lecture by the President, Mr. H. W. Monckton.

INSTITUTE OF CIVIL ENGINEERS, at 8.—Artificial Draught, as Applied by Fans to Steam Boilers: W. H. A. Robertson.

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